

# i-33/X-32/X-33 Indicate System





# **i-33/X-33/X-32**

## **Quick Start Guide**

Part Number 1003052-01

Rev A

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# Introduction

## Getting to know the i-33/X-32/X-33 Systems

Topcon's X-32™ and X-33™ systems for excavators are indicate grading systems providing 2D (X-32) and 3D (X-33) elevation grade control. The 3D system uses GNSS technology to precisely locate the bucket position (or cutting edge) of the machine in real time anywhere on the construction site. The 2D system uses a compass to achieve similar results. Both systems reduce the need for costly stakeout and survey.

Topcon's i-33™ system provides similar 3D functionality for dozers and scrapers, and is available in two configurations (single and dual GPS). The Single GPS configuration uses one GPS antenna, and the dual GPS configuration uses two GPS antennas.

## System Components

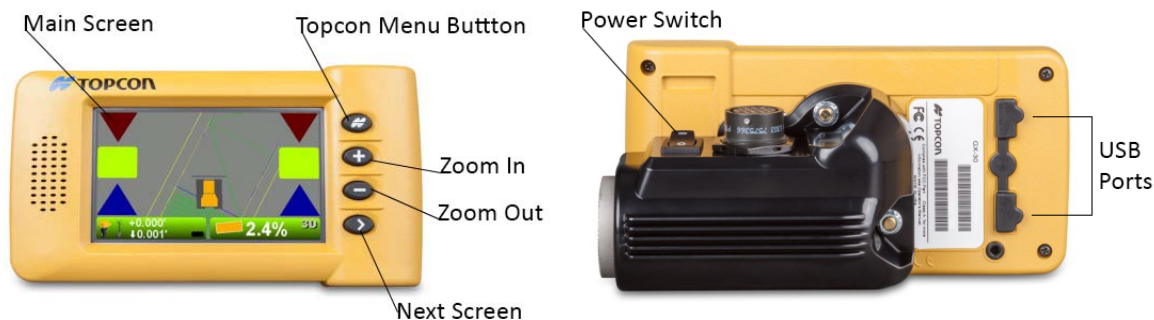
Table 1 lists the components of the X-32, X-33, and i-33 systems:

**Table 1. X-32/X-33/i-33 Components**

Machine Components	GNSS Components
GX-30 Control Box	Radio Antenna
Cables	MC-i3 GNSS Receiver
Mounting Hardware	GNSS Antenna and Radio
TS-i3 Tilt Sensors (X-32/X-33 Only)	
Compass (X-32 Only)	

## GX-30 Control Box

The GX-30 Control Box (Figure 1) is the operator's interface, as well as the primary control for the system components. It is a computer graphic display in a single, rugged unit that provides three-dimensional, stakeless GNSS control.



**Figure 1: Front and Back View of the GX-30 Control Box**

- The high-resolution, bright touch screen display easily adapts to a variety of machine applications, providing the operator with easy- to-view graphical information.
- A mounting bracket and one side clamp secure the Control Box in the cab or you can mount system with suction cup. The clamps provide easy attachment at the beginning of the day and easy removal for storage in the carrying case at the end of the day.
- One cable is attached in the back and can be easily removed with quick-disconnect connectors.

## MC-i3 GNSS Receiver

The MC-i3 GNSS Receiver (Figure 2) attaches to the machine with shock isolated magnetic mounts. It can be easily removed at the end of each day for storage.

The MC-i3 combines Topcon's GNSS receiver module and a radio module into a single, rugged housing. When used in conjunction with a base transmitter, this combination provides the control box and operator with Real Time Kinematic (RTK) measurements. The control box processes these real time measurements to compute grade and graphical mapping information.



**Figure 2: MC-i3 GNSS Receiver**

## PG-S3 GPS Antenna

For GNSS indicate applications, the PG-S3 GPS Antenna (Figure 3) can be affixed to the top of the mounting pole. The rugged antenna is specially designed to perform on earth-moving equipment.

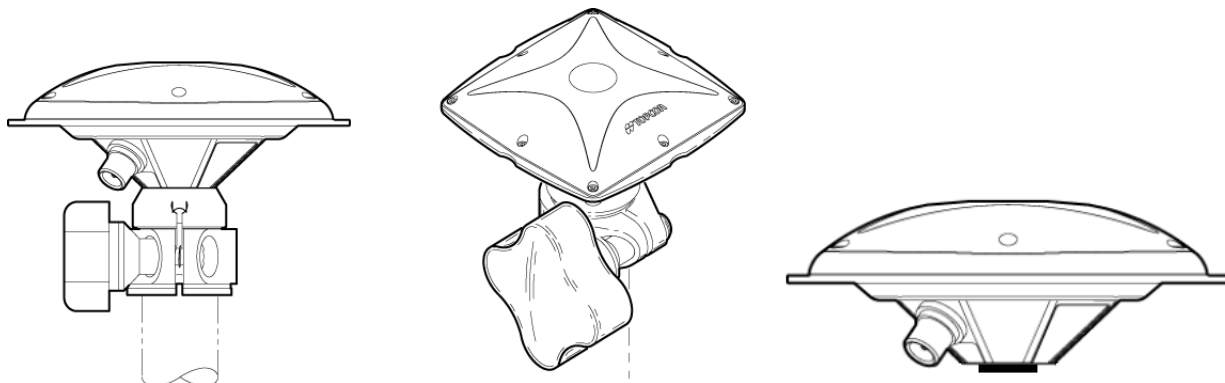
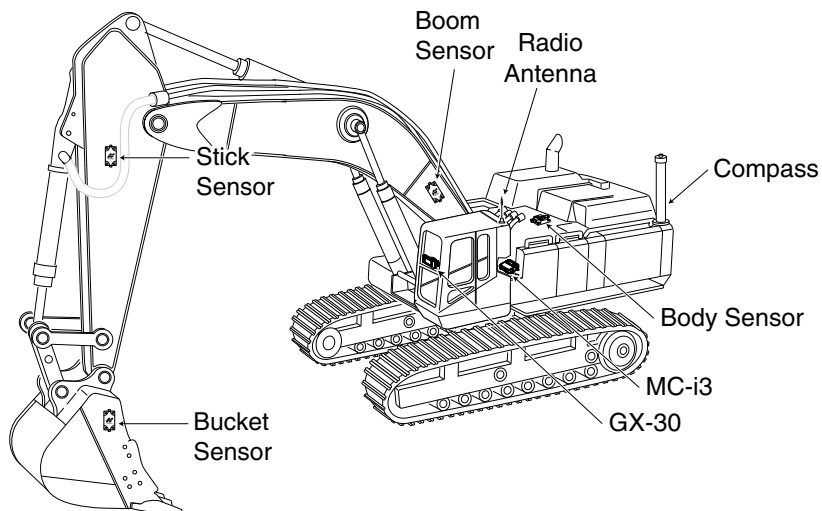


Figure 3: PG-S3 Antenna With and Without Mount

## X-32 Machine Configuration

- GX-30 Control Box
- TS-i3 Tilt Sensors (x4)
- Compass
- Radio Antenna
- MC-i3 GNSS Receiver





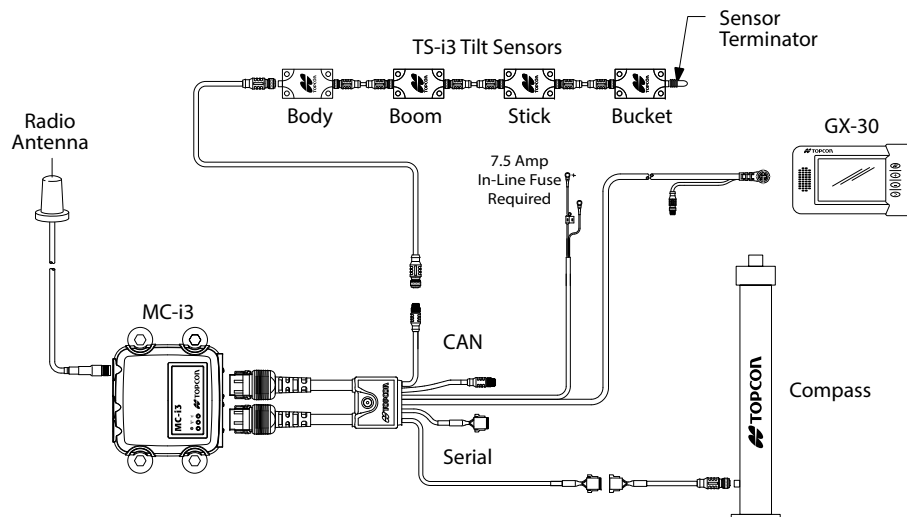
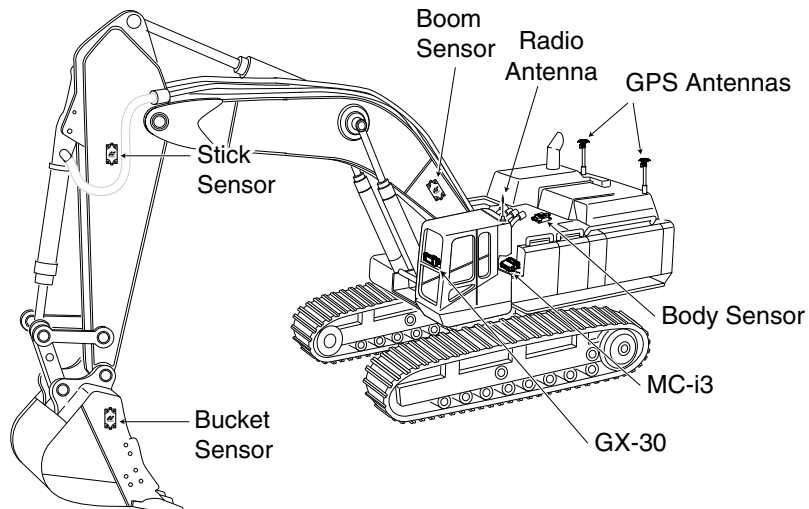
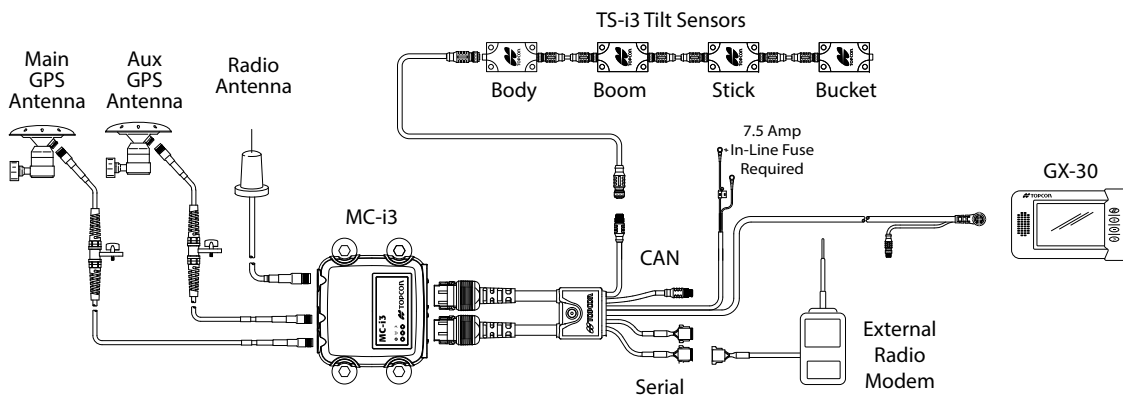


Figure 4: X-32 Components

## X-33 Machine Configuration

- GX-30 Control Box
- TS-i3 Tilt Sensors (x4)
- Radio Antenna
- GPS Antennas (x2)
- MC-i3 GNSS Receiver

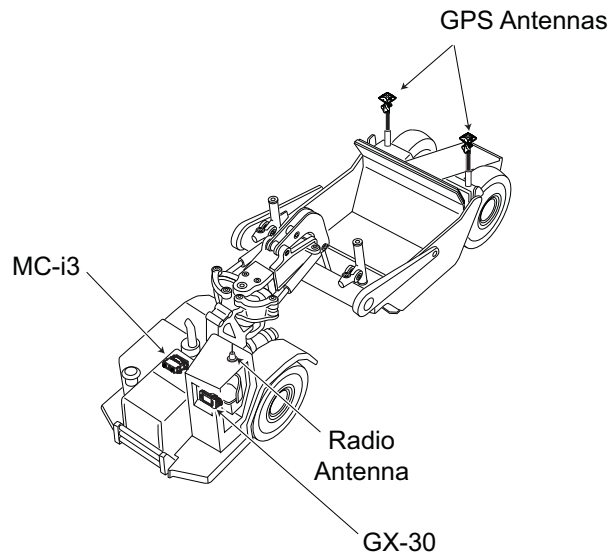




**Figure 5: X-33 Components**

## i-33 Machine Configuration

- GX-30 Control Box
- Radio Antenna
- GPS Antennas (Dual GPS Optional)
- MC-i3 GNSS Receiver



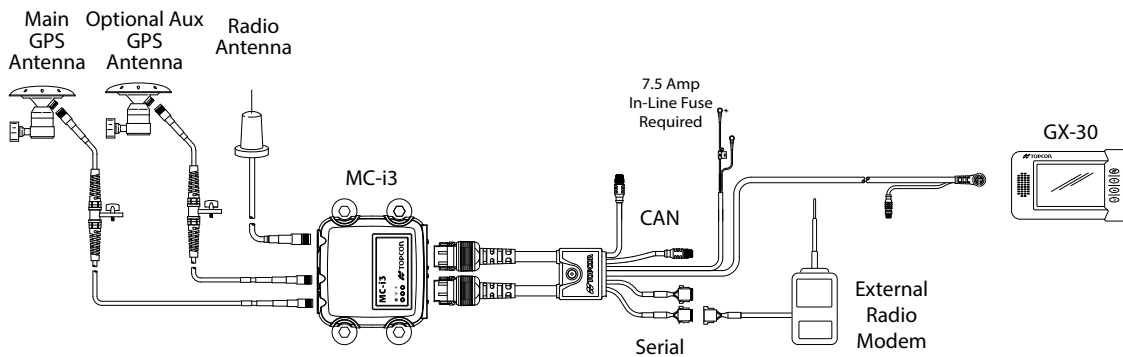


Figure 6: i-33 Components

# Features & Functions

## Component Functions

The X-32, X-33, and i-33 components constantly communicate with each other to provide accurate, real-time measurements. Each component has a specific function, which provides the operator with control, graphical job site displays, or GNSS measurements for quick and easy grading.

### Topcon Menu Button

The **Topcon Menu Button** is located at the top right corner of the GX-30 Control Box. When pressed, 3D-MC displays a list of four menus: **File**, **Control**, **Tools**, and **View** (Figure 7). The menus disappear if not used for ten seconds



Figure 7: Topcon Logo Menus

## File and Control Menus

The File menu (Figure 8) contains all of the functions needed to create new and edit existing 3D-MC project files. The Control menu contains options for machine setup, blade control, and as-built functions.

To access the File or Control menus, press the **Topcon Menu Button** and tap either **File** or **Control** on the screen.



Figure 8: File Menu and Control Menus

## Tools and View Menus

With the Tools menu (Figure 9) you can configure the radio, check the machine position, connect to Sitelink3D (OAF option), and perform data logging (OAF option). The View menu lets you change what is displayed on the left and right of the screen of the control box as well as enter authorization codes.

To access the Tools or View menus, press the **Topcon Menu Button** and tap either **Tools** or **View** on the screen.



Figure 9: Tools and View Menus



## Elevation Control Key



### Elevation Control Key

The Background color changes to indicate sensor status. Pressing this key displays the Adjust elevation dialog box for information and configurations.

### Sensor Status Color Key

Green = suitable for grading  
Orange = low GNSS accuracy  
Red = error

Figure 10: Elevation Control Key

## Adjust Elevation

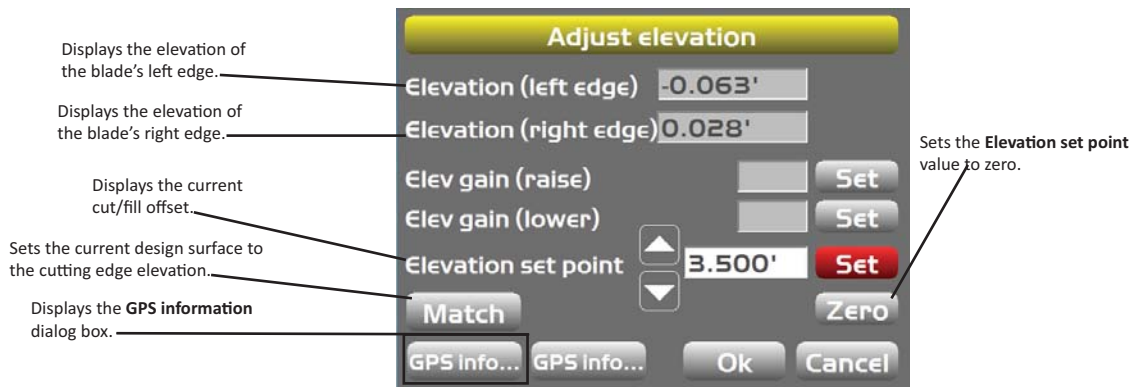


Figure 11: Adjust Elevation Screen



MC-i3 units with either FH915+ or Digital UHF2 will not have the second **GPS info...** button.

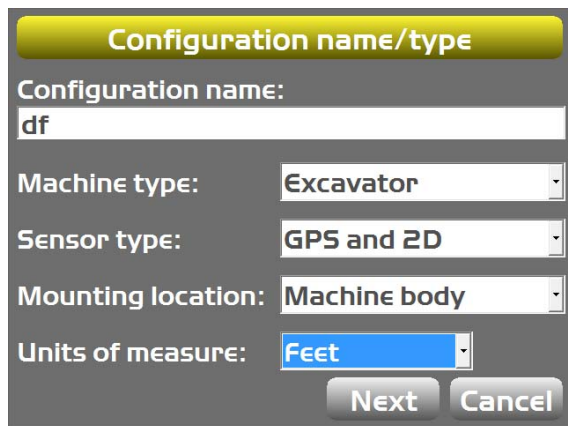
# Getting Started

## Creating a Machine Configuration File (X-32/X-33 Only)

The following briefly describes creating a machine configuration file and calibrating a bucket for X-32 and X-33 systems only. For a detailed procedure, see the *3D-MC Reference Guide P/N 7010-0911*.

### Machine Setup

1. On the GX-30, press the **Topcon Menu Button** and tap **Control ► Machine setup** in 3D-MC.
2. Tap **New** to begin creating a machine configuration file. The **Configuration name/type** screen appears.
3. Set up the machine name and type, and tap **Next** (Figure 12).
4. Set up the position and sensor inputs of the machine, and tap **Next**.
5. Configure the antenna mounting position and heights, and tap **Next**.
6. Set up the sensors for the frame, stick, dog-bone, and bucket, and tap **Next**. The **Excavator Buckets** screen appears.



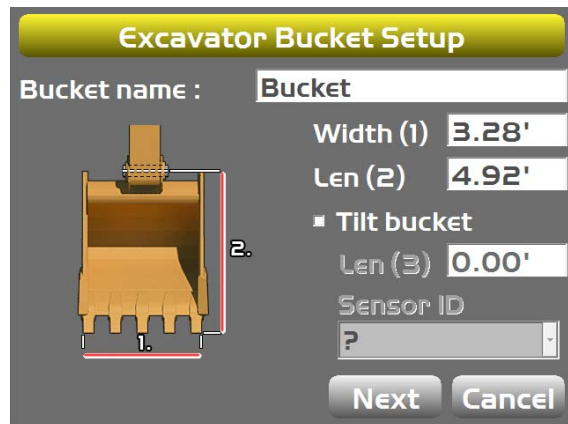
The screenshot shows a 'Configuration name/type' screen with the following fields and values:

Configuration name/type	
Configuration name:	df
Machine type:	Excavator
Sensor type:	GPS and 2D
Mounting location:	Machine body
Units of measure:	Feet
<b>Next</b> <b>Cancel</b>	

Figure 12: Machine Configuration

### Bucket Calibration

1. Tap **New** to begin creating a new bucket. The **Excavator Bucket Setup** screen appears (Figure 13).
2. Input the dimensions of the bucket and tap **Next**.
3. Calibrate the bucket edge and base, and tap **Finish**. The **Excavator Buckets** screen appears.
4. Select your bucket, and tap **Next**.
5. Set up the GPS information.
6. On the **Configuration Complete!** screen, tap **Finish**. Your machine configuration file is now finished.



**Excavator Bucket Setup**

Bucket name :

Width (1)

Len (2)

■ Tilt bucket

Len (3)

Sensor ID

Figure 13: Excavator Buckets

## Copying Files

You can copy any of the 3D-MC file types to and from a flash drive. The examples below use the **Project Files** screen, but any control point, surfaces, alignment, linework, points, or machine configuration file can be copied.

1. Insert a flash drive into the USB slot on the back of the control box, and power on the unit.
2. Press the **Topcon Menu Button** and tap **File ► Projects**.
3. On the **Project Files** screen tap **Copy**. The **Copy files** screen appears.
4. In the **From:** drop-down menu, select **F: to 3DMCi folder**. Note that the letter of the flash drive may be different (Figure 14 on page 19).

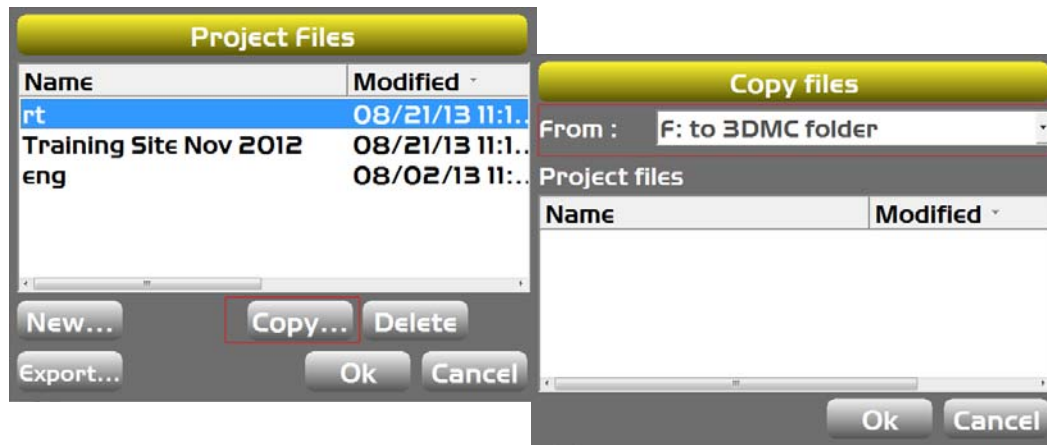


Figure 14: Copying Files From a Flash Drive

5. Select the desired files to copy and tap **OK**.
6. When the **Project Files** screen appears, tap **OK** to return to the main screen.

## Blade Control

The blade control function selects the point on the blade that will be the cutting edge. Note that the **Automatic best-fit** selection is not active for i-33 systems.

### Setting Blade Control

You can set the blade control point using either the **Section** view or the **Blade Control** menu. To change the blade control point using the **Section** view, follow the steps below.

1. Press the **Topcon Menu Button** and tap **View** ► **Left window** ► **Section**. The **Section** view appears on the left side of the screen.
2. Press and hold the edge of the blade for one second.
3. On the pop-up menu, tap **Move control left** or **Move control right**. The blade control arrow moves accordingly (Figure 15).

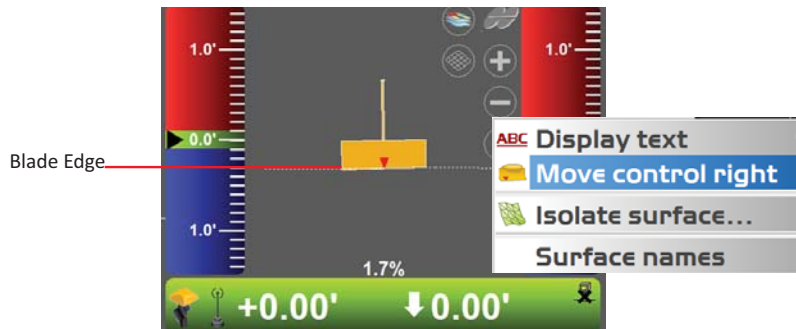


Figure 15: Setting the Blade Position With Section View

To change the blade control point using the **Blade Control** screen, follow the steps below.

1. Press the **Topcon Menu Button** and tap **Control ► Blade control**.
2. Select **Control using single point on blade**, and press and hold the slider button.
3. Move the slider button left or right to select the point from the side of the blade (Figure 11).
4. Tap **OK** to apply this point to the machine file.

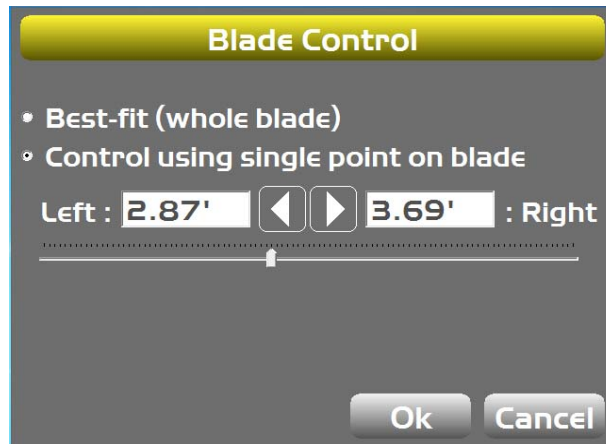


Figure 16: Blade Control Menu



For i-33 systems, the **Best-fit (whole blade)** option will appear on the screen, but will not be selectable.



## Indicate Grading Application

Once you have your system set up, most grading operations remain the same. While grading, you can:

- copy files
- change cut/fill offsets
- change the grade indicator scale
- check the blade position
- change radio channels
- Steer and grade to a polyline
- change the display units

### Changing the Cut/Fill Offset

The cut/fill offset can be manually adjusted, on the fly, relative to the design surface. After each pass, the cut/fill offset can be updated as necessary while approaching the final design surface.

## Changing the Grade Indicator Scale

The grade indicator acts as an infinitely scrolling grade tape, displaying the amount of cut or fill in regards to the design surface. To view the grade indicator, press the **Topcon Menu Button** and tap **View** ► **Left window** ► **Grade indicator** (Figure 17).

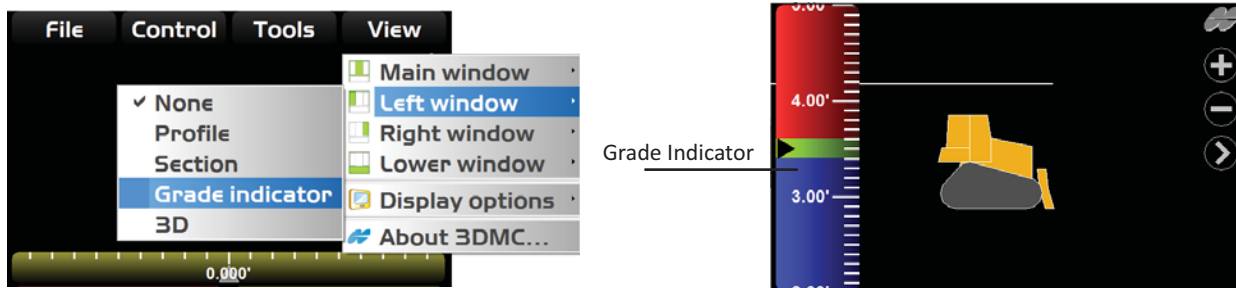


Figure 17: Grade Indicator

To change the **On-grade** (green zone) or **Extents** (unit spacing), press and hold the **Grade indicator** for one second, then tap the desired menu option (Figure 18).

- **On-grade** – displays the current on-grade zone width. Tap to display the numeric pop-up keyboard to change the on-grade zone.
- **Extents** – displays the current scale for the grade indicator. Tap to display the numeric pop-up keyboard to change the unit spacing.

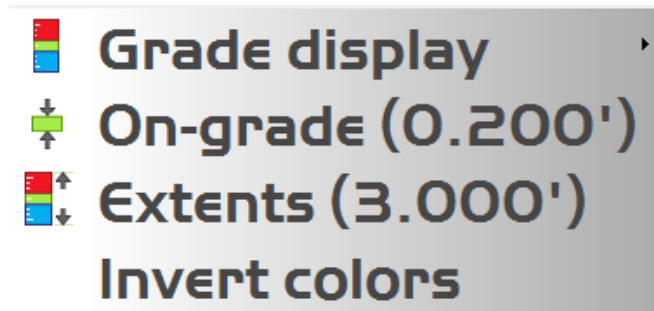


Figure 18: Changing On-grade and Extents

## Checking the Blade Position

The position check option provides a daily benchmarking tool to verify that the calculated elevation and position are repeatable.

1. To check the position of the blade, press the **Topcon Menu Button** and tap **Tools ► Position check**.
2. On the **Position Check** screen, select the **Point** (left, middle, or right), and tap **Measure** (Figure 19); the **Measuring** dialog box displays.

**Position Check**

Point: Blade: Left

North 15.624'

East -393.763'

Elev -3.501'

Fill to design surface : 6.952'

Alignment station: -3+93.763

Alignment offset: 2.420'

Measure... Save Cancel

**Measuring...**

Number of sats used 0

H.Precision 0.033'

V.Precision 0.033'

Duration (secs) 1

Measurements 2

Initialized !

Cancel

Figure 19: Checking the Blade Position

3. When finished, the **Position Check** screen displays the point on the job of the selected edge of the blade. Tap **Save**; the **Position Details** screen appears (Figure 20).
4. Select the appropriate options from the **Layer** and **Point Description** drop-down lists, and tap **OK**; the **Position Check** screen appears.
5. Tap **Cancel** to return to the main screen.

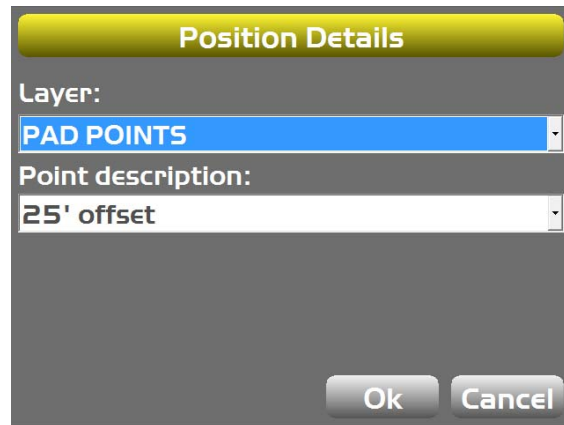


Figure 20: Position Details Screen

## Changing Radio Channels

If needed, you can use the control box to change the radio channel of Digital UHFII and other types of radio modems.

The MC-i3 GNSS Receiver stores radio settings, including the radio channel. Follow the steps below to set up or change the radio channel settings.

1. Press the **Topcon Menu Button**, and tap **Tools ► Configure Radios**.
2. On the **GNSS Radio Setup** screen, select your radio type and tap **Configure** (if available) to run the radio setting program (Figure 21). The configuration screen for your board type appears.

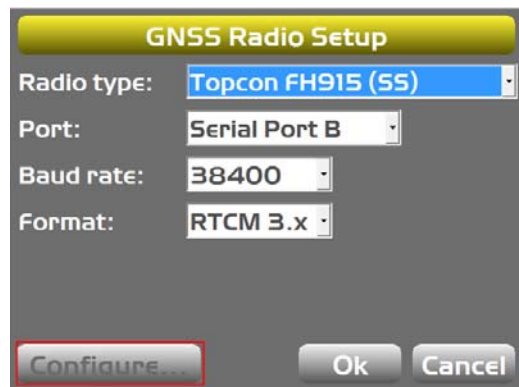


Figure 21: Configuring Your Radio Channel



It may take anywhere from few seconds to a few minutes to connect to the radio module, and check the current setting. When the current setting is confirmed, the radio's channel and frequency information displays.

- On the configuration screen, tap the **Channel** drop-down list box and select the desired channel number. The frequency of the channel changes automatically depending on the selected channel (Figure 22).

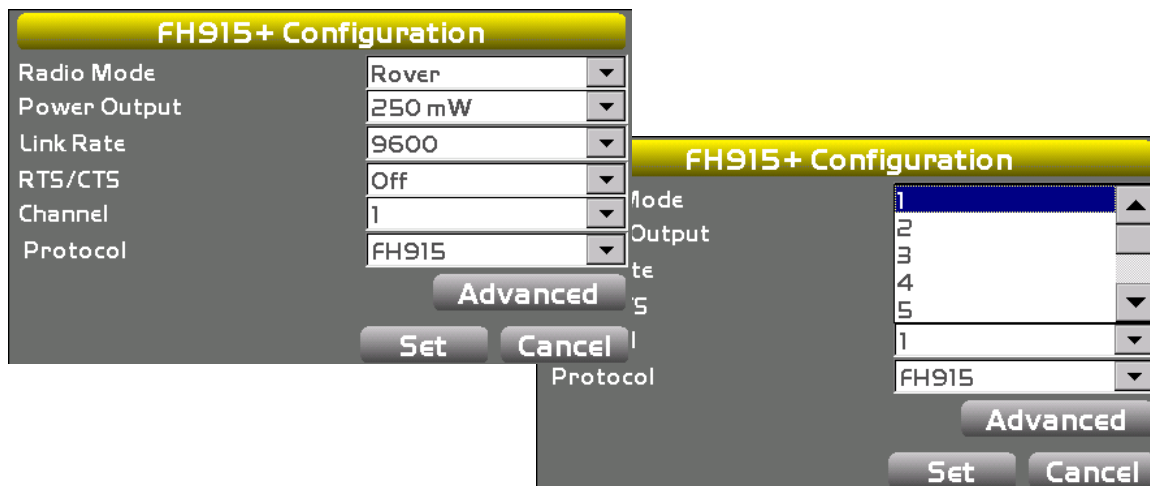


Figure 22: Setting the Channel number

4. Tap **Advanced**, select the country appropriate to your project, and tap **OK** (Figure 23).

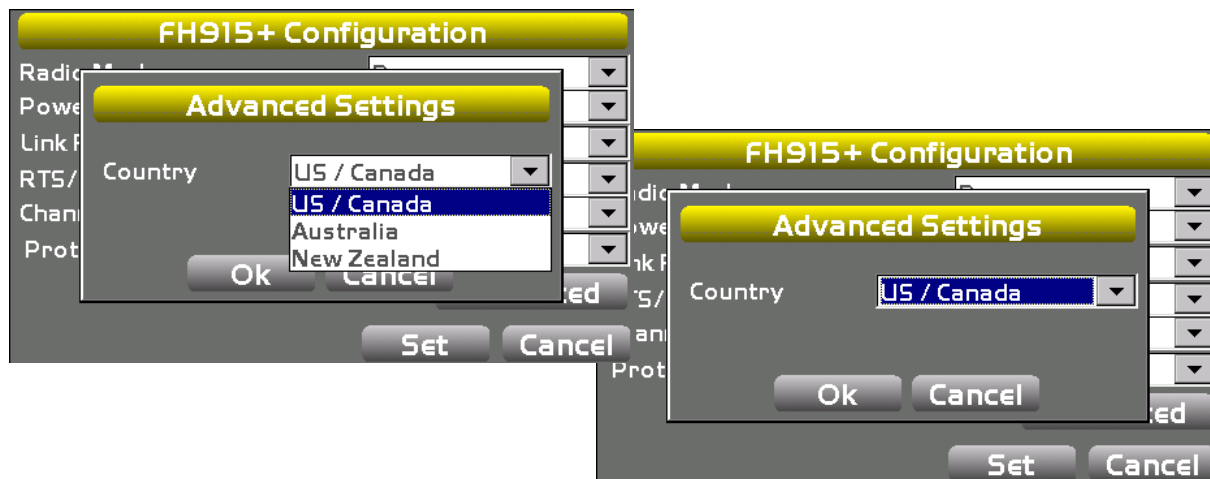


Figure 23: Setting the Country for the Project

5. Tap **Set** to activate and save the new radio channel setting. It may take anywhere from a few seconds to a few minutes to complete the process.



If you have difficulty connecting to the radio module when changing radio configurations, disconnect the radio antenna cable at the MC-i3 Box. The base station radio can interfere with the machine radio when making changes.



## Steering and Grading to Polyline

Polylines are part of a linework, which are contained in layer files. The polyline represents features or objects such as building pads, curbs, sidewalks, top and toe of slopes, or any boundary on the project. The control box can control a machine to steer and cut to a polyline. You can select three-dimensional information at each transition point of a polyline to steer the machine to a particular area. Polylines can also represent design elevation to control the cutting edge.

### Loading a Linework from a Project Layer

1. Press the **Topcon Menu Button**, and tap **File ► Layers**.
2. Select a layer file from the **Project Layers** screen, and tap **Import**.
3. In the **Import Project Data** screen, select **Linework from project file (TP3)** and **3DMC folder** from the **What:** and **Where:** drop-down lists.

4. Select the desired file from the **Project files** list, and tap **OK** (Figure 24).

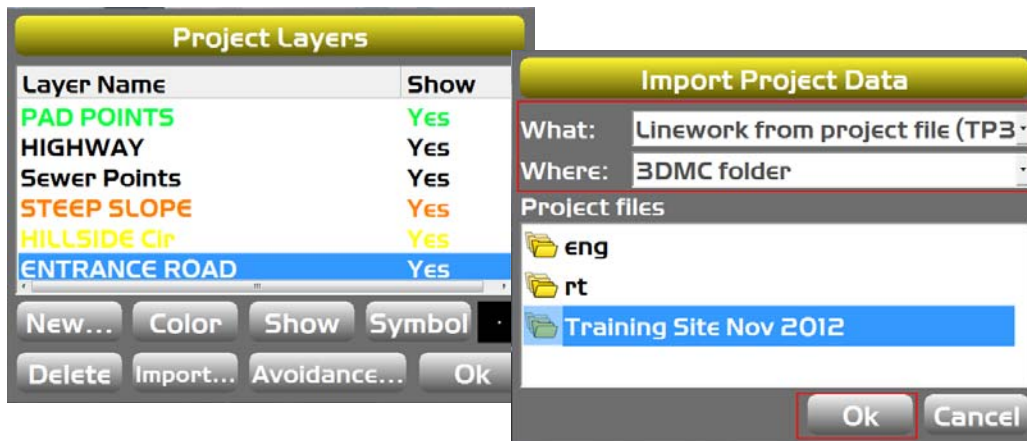


Figure 24: Importing a Linework from a Project Layer

5. From the **Linework(s)** screen, select **All polylines** and tap **Next**; the **Summary** screen displays the number of polylines imported.

- On the **Summary** screen, tap **Finish** to return to the **Project Layers** screen (Figure 25).

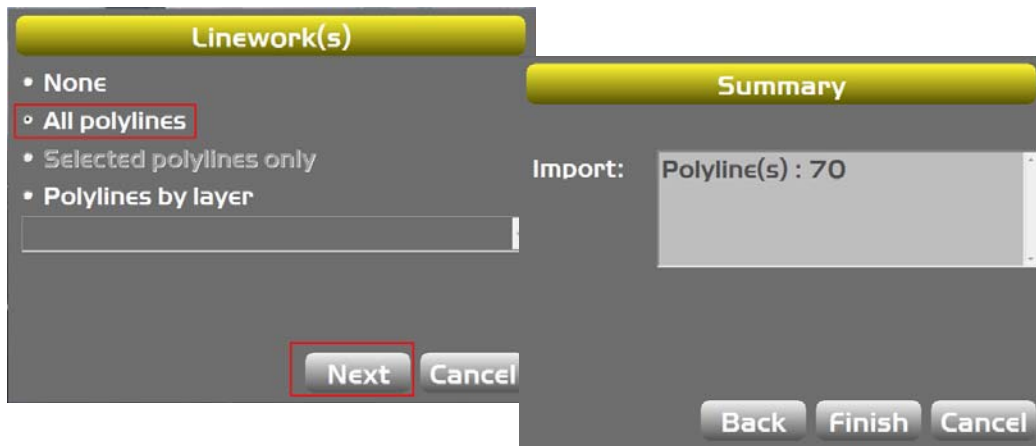


Figure 25: Importing Linework and Polyline

- On the **Project Layers** screen, tap **OK** to return to the main screen.

## Steering to Polyline

1. To select a polyline for steering, press and hold on the desired polyline on the main screen; a pop-up menu appears. (Figure 26).

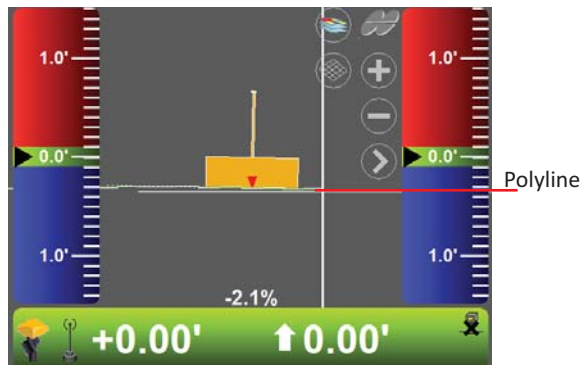


Figure 26: Polyline

2. On the pop-up menu, tap **Polyline ► Steer to**; graphical cross lines display along the selected polyline (Figure 27).

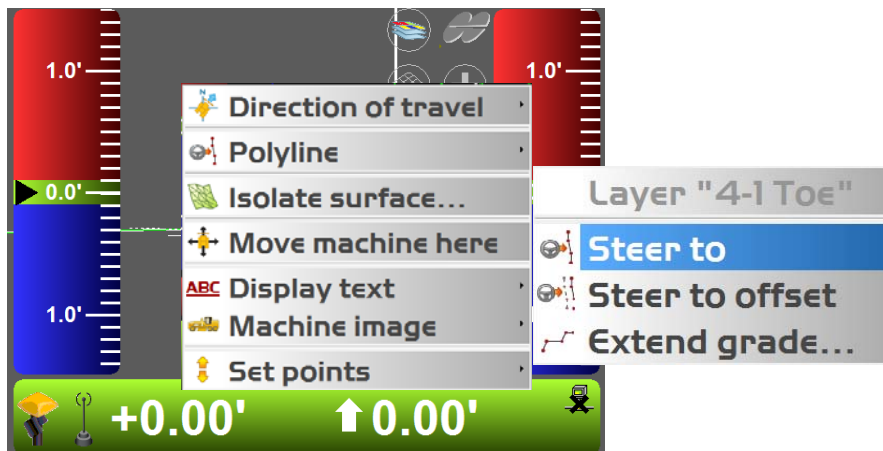


Figure 27: Selecting and Steering to a Polyline

3. To change the steering indication, press the **Topcon Menu Button** and tap **Control ► Steer indication**; enter the desired changes and tap **OK**.(Figure 28).
4. To select another polyline, repeat steps 2 and 3.
5. To change the alignment file, press the **Topcon Logo Button** and tap **File ► Active ► Alignment**. The current polyline displays in the list with a check next to it.
6. To choose a new alignment, select it from the list.

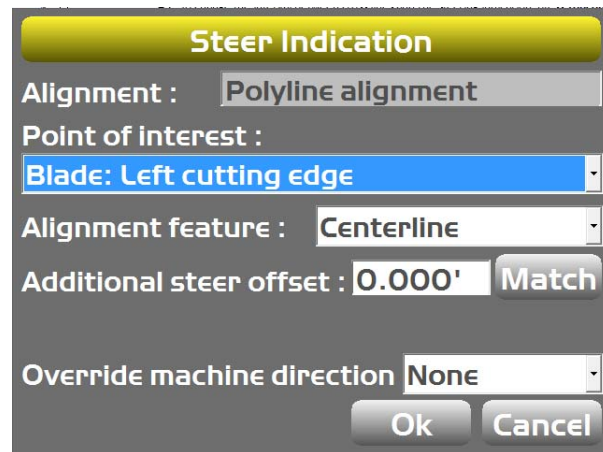


Figure 28: Changing the Steer Indication

## Grading to Polyline

1. To select a polyline for grading, press and hold on the desired polyline on the main screen; a pop-up menu appears.
2. Tap **Polyline** ► **Extend grade**; graphical cross lines display along the selected polyline (Figure 29).

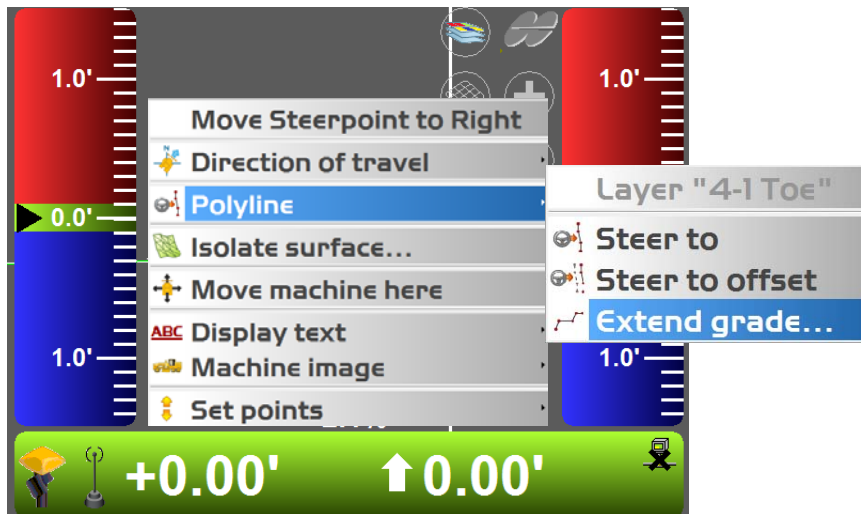


Figure 29: Grading to Polyline

## Changing the Display Units

On the **Display Units** screen, you can change the type of units displayed on the screen, or update preset units in the files currently being used without affecting grade accuracy. You can choose among the following:

- **Distances** – select either Meters, US survey feet, or International feet
- **Angles** – select either DD<sup>°</sup> MM' SS", NDD<sup>°</sup> MM' SS", or Gons
- **Grades** – select either Percent (%) or Run : Rise
- **Stations** – select either 100.000, 1+00.000, or 10+0.000
- **Volumes** – select either Cubic meters or Cubic yards
- **Coordinates** – select either North-East-Elev, East-North-Elev, or X-Y-Z

To set the type of units used in the job, press the **Topcon Menu Button** and tap **View ► Display options ► Display units**. The **Display Units** screen appears (Figure 30).

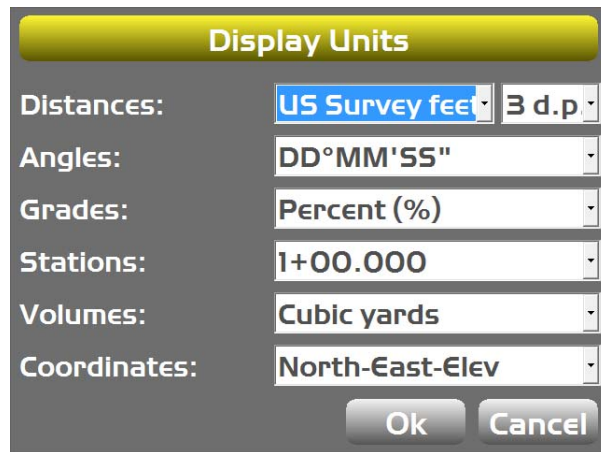


Figure 30: Changing the Display Units



## Slope Profiles (X-32/X-33 Only)

The following section is a brief description of how to enter slope profiles in 3D-MCi for X-32 and X-33 systems. For a detailed description, see the *3D-MC Reference Guide P/N 7010-0911*.

### Known Slope

1. On the GX-30, press the **Topcon Menu Button** and tap **Tools ► Known Slope**.
2. Enter the **Grade** percentage or the **Rise** and **Run** values, and tap **OK** (Figure 31 on page 39).

### Known Dual Slope

1. On the GX-30, press the **Topcon Menu Button** and tap **Tools ► Known Dual Slope**.
2. Enter the **X/Y Slope** percentage or the **X/Y Rise** and **Run** values, and tap **OK** (Figure 32 on page 39).

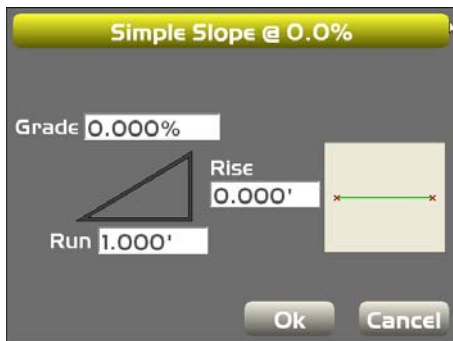


Figure 31: Setting a Known Slope



Figure 32: Setting a Known Dual Slope

## Measured Slope

1. On the GX-30, press the **Topcon Menu Button** and tap **Tools ► Measured Slope**.
2. Set the bucket teeth on the slope to be measured, and tap **OK** at the prompt to measure the first point.
3. Move the bucket teeth to another location on the slope, and tap **OK** at the prompt to measure the second point.

## Complex Slope

1. On the GX-30, press the **Topcon Menu Button** and tap **Tools ▶ Complex Slope**.
2. Name the slope, and tap **Add** (Figure 33).
3. Enter the slope element values, and tap **OK** (Figure 34).
4. Repeat steps 1-3 to add more slope elements.



Figure 33: Add a Complex Slope

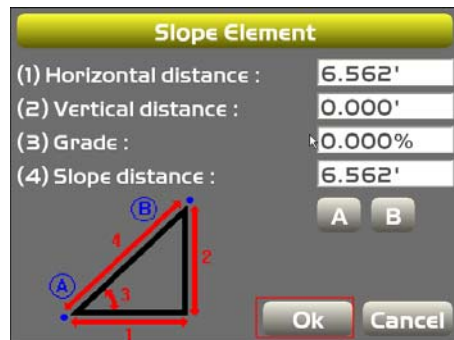


Figure 34: Enter Slope Elements

## Normal to Surface

To indicate a surface cut/fill that is perpendicular (normal) to the surface model of an excavator, tap **Control ▶ Elev. Reference ▶ Normal to surface**.

## Referencing

### Zero to Bucket

1. In 3D-MC, tap the **Elevation Control Key**. The **Adjust Elevation** screen appears.
2. Tap **Zero to Bucket** (Figure 35)

The bucket teeth are now used as the height reference for Known, Measured, and Complex Slope profiles.

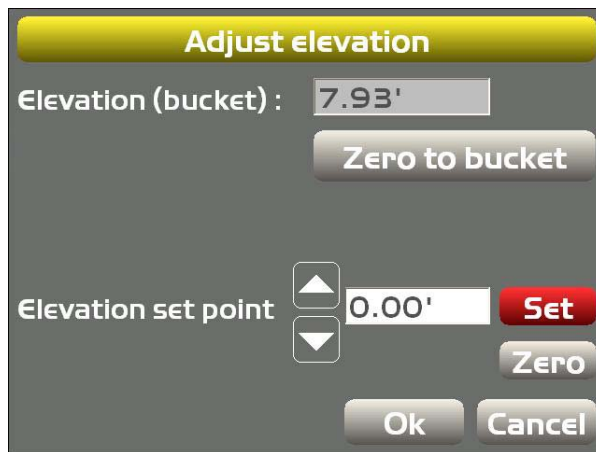


Figure 35: Zero to Bucket

## Reverse Slope Direction

To reverse the slope direction, tap **Tools** ► **Reverse slope direction** (Figure 36).

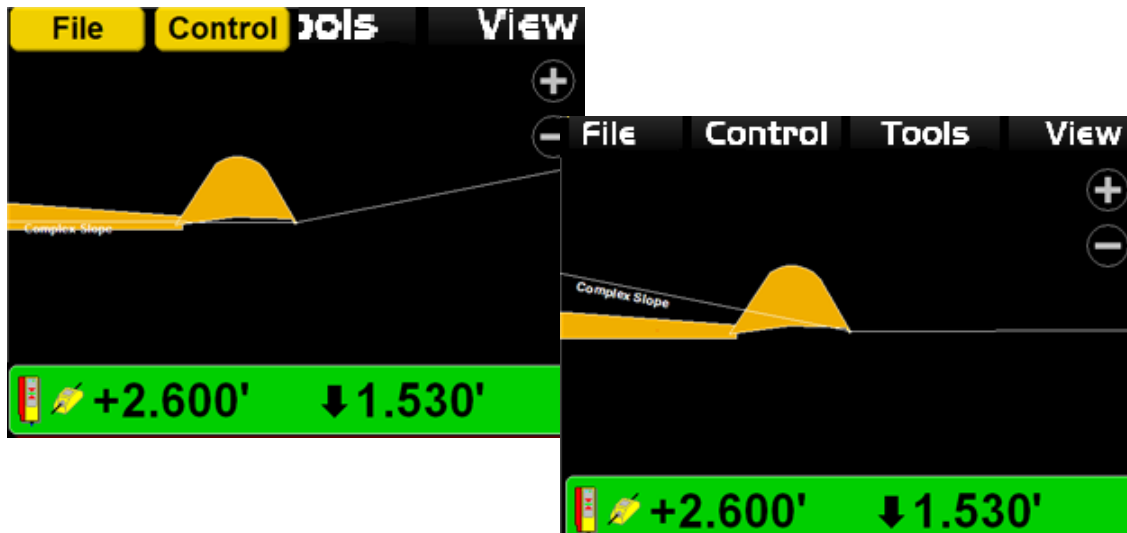


Figure 36: Reversed Slope Direction



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### **i-33/X-32/X-33 Quick Start Guide**

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